

Q.1. Find the Laplace Transform of $f(t) = e^{-5t} u(-t) + t e^{-7t} u(t)$
Find the ROC.

Ans :- $F(s) = \frac{-2}{s^2 + 12s + 35}$; ROC: $-7 < \text{Re}(s) < -5$

Q.2 Find $f(t)$ if $F(s) = \frac{s+4}{(s+2)(s+3)}$ for $-3 < \text{Re}(s) < -2$.

Ans :- $f(t) = -2 e^{-2t} u(-t) + (-1) e^{-3t} u(t)$

Q.3 Determine $f(t)$ with $F(s) = \frac{s+2}{(s+3)(s+4)}$ with

(i) $\text{Re}(s) < -4$

(ii) $\text{Re}(s) > -3$

(iii) $\text{Re}(s)$ lying between -3 and -4

Ans :- i) $f(t) = e^{-3t} u(-t) - 2 e^{-4t} u(-t)$

ii) $f(t) = (\bar{e}^{-3t} + 2 \bar{e}^{-4t}) u(t)$

iii) $f(t) = e^{-3t} u(-t) + 2 \bar{e}^{-4t} u(t)$

Q.4 Verify the initial value theorem and final value theorem for $F(s)$ as

$$F(s) = \frac{s+3}{s(s+1)(s+2)}$$

Q.5 Find a differential equation / ^{difference} description of the system described by the following transfer function

i) $H(s) = \frac{s^2 - 2}{s^3 - 3s + 1}$

(ii) $H(z) = \frac{5z + 2}{z^2 + 3z + 2}$

ii) $H(s) = \frac{2(s+1)(s-1)}{s(s+2)(s+1)}$

Also represent its block diagram